Could We Predict Caries Risk In Children before They Were Born? The Sensitivity and Specificity Test of Mother Belief Early Childhood Caries Risk Predictor Software

by Darmawan Setijanto

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Could We Predict Caries Risk In Children before They Were Born? The Sensitivity and Specificity Test of Mother Belief Early Childhood Caries Risk Predictor Software

Taufan Bramantoro[a*] ,UdijantoTedjosasongko[b] , Darmawan Setijanto[c] , Dian Agustin Wahjuningrum[d] , Achmad Zam Zam Aghasy[e]

[a,c]Department of Dental Public Health, Faculty of Dental medicine, Airlangga University, Surabaya-Indonesia
[b] Department of Pediatric dentistry, Faculty of Dental medicine, Airlangga University, Surabaya-Indonesia
[d] Department of Endodontics, Faculty of Dental medicine, Airlangga University, Surabaya-Indonesia
[e] Master programme of Dental science, Faculty of Dental medicine, Airlangga University, Surabaya-Indonesia

* Corresponding author: taufan-b@fkg.unair.ac.id

ABSTRACT

There were approximately 7 until 9 of 10 children suffering dental caries. Prevention of dental caries should be started since early childhood and needs comprehensive strategies. Mother's belief on dental health determines mother's behaviour on protecting and maintaining children's dental health. Aim: The aim of this study is to analyze sensitivity and spesifity test of mother belief early childhood caries risk predictor software. Method: A cross-sectional study was conducted on Surabaya and involved 126 mothers paired with their children. The mother answered the question on early childhood caries risk predictor and the children were examined regarding their dental caries. Result: The sensitivity of predictor software to predict high risk of dental caries was 93% and the specifity to predict low risk of dental caries was 82%. Conclusion: Mother belief early childhood caries risk predictor software had high sensitivity and specifity to predict early childhood dental caries risk.

INTRODUCTION

There were approximately 7 until 9 of 10 children suffering dental caries. Prevention of dental caries should be started since early childhood and needs comprehensive strategies. The movement of dental caries prevention and treatment has been shown positive and dynamic development, but dental caries problems still showing high prevalence rates, particularly in developing countries (Peterson, 2008). Review of several studies on dental caries in some countries in the world, specifically developing countries shows that dental caries still regarded as frequent or common dental health problem in early childhood and preschool between ages one to six years old (Peterson, 2008; Bagramian et al, 2009). Dental caries still as a major health problem and has the potential to grow in various parts of the world. According to Petersen,1 the high incidence of dental caries, not only in developing countries, but also in developed countries, there are some spreads in several countries in Asia and Latin America. In some studies referred by Bagramian et al, dental caries still be called a common dental health problem and mostly found in early childhood and preschool between the ages one to six years old (Bagramian et al, 2009). The problem of dental caries in children requires particular and more attention because not only has the potential to develop, but also has significant impact on the quality life of children which related to disruption of the mastication system and the daily activities (Ismail, 2003; Fisher-Owens, 2007) .

The problems of dental caries in children, especially dental caries in early childhood has multilevel and multifactorial causes, thus requiring dental caries prevention efforts with comprehensive strategy and perspective. The consideration of prevention efforts along with activities which related to the process of nutrition intake, healthcare and controlling children's growth and development process (Tinanoff and Reisine, 2009; Mouradian, 2001; Slabšinskienė, 2010). Home environment with parents, siblings, or caregivers as a primary involvement, has an important role in the process of establishing health behavior. Parents attitude and behavior, particularly mother, have a role in early childhood development with age range when the child has sensitive life cycles to the various influence (Slabšinskienė, 2010; Wigen and Wang, 2011; Wigen and Wang, 2012; Okada et al, 2002).

Mother's belief regarding dental health determine mother's behaviour on protecting and maintaining children's dental health. Mothers have an important role related to condition of children health, particularly in early childhood. These can be support of child health behavior and the provision of health facilities and access to health services for children. The presence of mother in the family can be used as an early social environment which considered to have a significant impact in improving welfare of mental and physic. This required to the prevention of disease and the influence on child health behaviour (Pusponagoro, 2010). Mother belief early childhood caries risk predictor software as an outcome of the mother belief study related to children dental health status has been developed to answer that challenge. The caries predictor software is an implementation of the mother dental health belief relationship analysis model of early childhood caries risk, consisting of 4 factors, namely Susceptibility, Severity, Benefit, and Barrier. The aim of this study was to analyze sensitivity and

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spesifity test of mother belief early childhood caries risk predictor software.

MATERIALS AND METHOD

A cross-sectional study was conducted on Surabaya and involved 126 mothers paired with their children. The mother answered a questionnaire on early childhood caries risk predictor and the children were examined regarding their dental caries. A sample of 126 pairs of mothers and children was taken by purposive sampling, ie children of mothers with children after getting ethical clearance and informed consent. Each mother measured the risk of caries in children using caries predictor software. Each child received a measure of caries severity with DMF-T index, with high and low caries classification. High caries with a DMF-T index is more than 6, whereas low caries with a DMF-T index is less than or equal to 6.

The caries risk factor measured in caries predictor software consists of 4 factors, namely Susceptibility, Severity, Benefit, and Barrier from the mother. Sensitivity is the result of a true positive comparison to true + false negative. The specificity of the comparison between true negative to true + negative is true. PPV is the ratio between true positive to true positives + pseudo positivity and NPV is a comparison between true negative to true negative + false negative (Petrie, 2010; Tsai *et al*, 2006).

RESULTS AND DISCUSSION

Demographic distribution shows that 61.11% respondents of mothers are aged less than 30 years. Most of the respondents 80.95% have education level above bachelor degree.63.49% respondents are non-working mother (Table 2).

Table 2: Mother characteristic statistical description

Characteristic	Criteria	Frequency	
		n	(%)
Age	> 30 years	49	38.89
	< 30 years	77	61.11
Education	> Bachelor Degree (S1)	102	80.95
	< Bachelor Degree (S1)	24	19.05
Occupation	Working	46	36.51
	Non working	80	63.49

Results of caries risk measurements with caries prediction software show that 22 children has low caries risk and 104 has high caries risk (Table 4). On the other hand, the result of the caries measurement in children with DMF-T index showed 109 children has high caries, and 17 children has low caries (Table 4).

The sensitivity of children's caries predictor software is 101/109 x 100% = 92.66%, whereas the specificity is 14/17 x 100% = 82.35%. The result of PPV measurement is 101/104 x 100% = 97.12%, and NPV obtained 14/22 x 100% = 63.64% (Table 5).

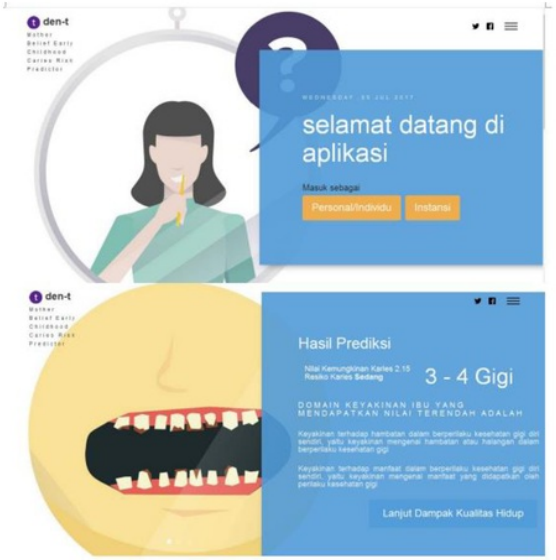

Fig1. Layout of mother belief early childhood caries risk predictor software

Knowledge-behavior interaction in dental hygiene activities of children and their parents, and delayed children first dental visit have association with early childhood caries incidence (Vanagas, 2009; Chu *et al*, 2012; Naidu *et al*, 2011; Naidu, 2013). Mother's influence on early childhood dental health status is related to mother's behavior in promoting children's dental hygiene and their dental hygiene as well. Mother's health behavior on themselves has a significant association with early childhood caries experience.

Moreover, mother's behavior in toothbrushing have association with their children (Wigen and Wang, 2012; Okada *et al*, 2002; Bozorgmehr, 2013; Locker, 2007; Piovesan *et al*, 2010; Goettems, 2011).

Table 3: Risk factor distribution of mother caries risk with caries predictor software

Risk factor	Mean	Standard deviation	Standard error of the mean	Lower bound on mean (95%)	Upper bound on mean (95%)
Susceptibility	2.679	0.699	0.063	2.555	2.802
Severity	2.879	0.560	0.050	2.780	2.978
Benefit	3.250	0.466	0.042	3.167	3.333
Barrier	2.563	0.646	0.058	2.449	2.678

Table 4:Result of caries predictor software and child caries cross-tabulation

Result		Child Caries		
	Prediction Result	High Caries	Low Caries	Total
Caries Predictor Software	High Risk	101	3	104
	Low Risk	8	14	22
	Total	109	17	126

Table 5: Sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV)

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Sensitivity (%)	Specificity (%)	Positive Predictive Value (PPV) (%)	Negative Predictive Value (NPV) (%)
92.66	82.35	97.12	63.64

Measurements of caries in 126 children, and measurement of caries risk for 126 mothers, obtained high caries in 109 children and high risk of childhood caries in 101 mothers, so that it can be said the sensitivity of child caries predictor is 92.66%. The specificity of child caries predictors was 82.35%, significant in 17 children with low caries, there were 14 mothers with low caries risk. These results suggest that children's caries predictor software can measure 92.66% of children with high caries and 82.35% of children with low caries. From 104 mothers who were predicted to have children with high caries risk, there were 101 children with high caries, resulting in PPV 97.12%. These results indicate that if this examination gives a positive result, then 97.12% of these tests will show high caries results, while 2.88% have low caries. From 22 mothers who were predicted to have children with low caries risk, there were 14 children with low caries, resulting in NPV 63.64%. These results indicate that if this examination gives negative results, then 63.64% of these tests will show low caries results, while 36.36% have high caries. The prediction model of caries generally has sensitivity between 29-70% and specificity 65-80% (Aleksejuniene, 2009). The caries prediction tool that has sensitivity, specificity, PPV and NPV 70-100% is included in the good category until very good, so it can be said to have high validity (Ditmyer, 2011).

CONCLUSION

From the results of the above research, it can be concluded that caries predictor software has a high sensitivity, specificity, PPV and NPV and can be used as an instrument to predict the occurrence of caries risk in children.

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